

REMARKS

In order to understand the claims 14-25 which are presented by this amendment, consider the following explanation. The present patent application, as originally filed, contained system claims 1-13. Thereafter, in an amendment mailed on December 14, 2005, the system claims 1-13 were changed to method claims 1-13. Then, in an office action mailed on January 5, 2006, the method claims 1-13 were "withdrawn from consideration as being directed to a non-elected invention". See the next-to-the-last sentence on the bottom of page 2 of the office action.

In view of the above, the present amendment cancels the method claims 1-13 and adds system claims 14-25. These system claims 14-25 correspond to the original system claims 1-13 as shown below.

Claim 14 corresponds to claim 1 + claim 2 + a pressure regulating means.

Claim 15 corresponds to claim 3.

Claim 16 corresponds to claim 4.

Claim 17 corresponds to claim 5.

Claim 18 corresponds to claim 6.

Etc., etc. for all remaining claims.

By the present amendment, claim 14 is modified to recite a system which overcomes the prior art rejection that was given in the office action of 10/26/05. In paragraph 2 of the 10/26/05 office action, independent claim 1 (now claim 14) is rejected on the ground that it is anticipated by the teachings of U.S. Patent 6,889,509. This rejection makes particular reference to Fig. 8 of

patent `509. According to the rejection, the "pressure reducing means" in claim 1 is shown by item 66 in Fig. 8 of patent `509.

To overcome this rejection, claim 14 is hereby modified to expressly recite three limitations that are not taught or suggested by patent `509. The first limitation is that claim 14 calls for a "pressure regulating means". This pressure regulating means is shown as components 22c and 25 in Fig. 1 of the present application. These components 22c and 25 are described in TABLE 1 of the Detailed Description on pages 12-13.

By comparison, in patent `509 there is no corresponding pressure regulating means. Instead, the cited item 66 in Fig. 8 of patent `509 is merely a "vacuum manifold". But a "manifold" does not "regulate" pressure. The manifold 66 is merely a hollow tube which has multiple inputs and one output. The output of the manifold 66 is not even shown in Fig. 8, but it apparently connects to the "vapor return line" which is connected to a pump 53 in Fig. 5.

Also in Fig. 5, another pump 51 sends liquid coolant to a "coolant supply" line, and that "coolant supply" line is again shown in Fig. 8 where it sends coolant to the spray cavity 64. Thus the pressure in the spray cavity 64 is increased by the Fig. 5 pump 51, and is decreased by the Fig. 5 pump 53. But no component in Fig. 5 or Fig. 8 "regulates" the pressure in the spray cavity 64. Without any pressure regulating means, the pressure in the spray cavity 64 will vary wildly and can be above atmospheric when the burn-in testing occurs.

A second limitation in claim 14 is that the pressure regulating means is for "maintaining said sub-

atmospheric pressure . . . while the temperature of said IC-module is kept near said set-point". This limitation is described in the Detailed Description of the present application from line 11 on page 15 to line 23 on page 16.

By comparison, in patent `509, the sub-atmospheric pressure in the spray chamber 64 is only described as occurring after the burn-in testing of the IC-module "is completed". See column 8 at lines 3-13. There, the only reason for generating the sub-atmospheric pressure in the spray chamber is to vacuum out any coolant that "remains" within the spray chamber "after" the burn-in testing the IC-module is completed.

See also column 2 at lines 52-55 which indicates that the invention in patent `509 is merely a scheme for recovering "liquid coolant that remains upon the burn-in boards . . . at the completion of a burn-in cycle". In this recovery scheme, the pressure in the spray chamber is reduced to sub-atmospheric while temperature of the IC-module is not even controlled.

A third limitation in claim 14 is that while the temperature of the IC-module is kept near the set-point, the sub-atmospheric pressure is maintained "such that the boiling point of said liquid is lowered by at least 10°C from its boiling point at atmospheric pressure." This limitation is described on page 23 of the Detailed Description at lines 5-25. Due to this limitation, the minimum set-point temperature for the IC-module in the present claim 14 is lower than the minimum set-point temperature in patent `509.

The above cited portion of the Detailed Description says that the lowest temperature to which an

IC-module can be maintained by spray cooling is "just slightly above the temperature at which the coolant droplet 40 vaporizes". See lines 10-13 on the above cited page 23.

This technical fact is established by equation 2 in Fig. 4. There, the first term $(\Delta T) (C_p)$ is the amount of heat that is removed from the IC-module when one gram of coolant water heats from the temperature at which it is sprayed to its vaporization temperature, and the second term 2260 J/gr is the amount of heat that is removed from the IC-module when the gram of coolant water evaporates. The description, on line 27 of page 20 to line 8 on page 21 says that the first term is so small in comparison to the second term that the first can be ignored.

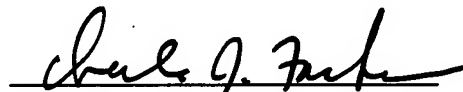
Thus the lowest temperature which the IC-module can reach is just slightly above the vaporization temperature of the coolant. The lowest temperature which the IC-module can reach is not the temperature at which the coolant is sprayed.

The above technical fact is not taught by patent '509, and is completely overlooked by patent '509. In patent '509, the pressure in the spray chamber is not made sub-atmospheric to lower the set-point temperature. The sub-atmospheric pressure in patent '509 is only used to suck coolant from the spray chamber after the burn-in cycle is completed, which is when the temperature of the IC-module is unregulated and not at the set-point temperature.

Based on all three differences which have been pointed out above, between claim 1 as amended and patent '509, it is respectfully submitted that the rejection of claim 1 has now been overcome. Entrance of this amendment

and an early Notice of Allowance of claim 14, as well as its narrower dependent claims 15-25, is requested.

Respectfully submitted,



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January 24, 2006

